

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry (Hons.)

PART-I, PAPER-I

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

- (a) What do you mean by Quantum Number ?
(b) Write down all the four Quantum Number for $4s^1, 5p^4, 3d^7, 5f^3$.
- (a) Classify, the elements given below is s, p d and f block.
(b) Atomic number 6, 42, 89, 92, 11, 87, 58, 90.
- How H_2O_2 is prepared and concentrated ? What do you mean by strength of H_2O_2 ? Suggest the structure of H_2O_2 on the basis of its chemical behaviour. Give atleast two reactions for oxidizing and reducing property given by H_2O_2 .
- Write notes on any two of the following :—
 - Bragg's law.
 - Lattice energy.
 - Born-Haber cycle.
- Distinguish between ideal and real gas. Derive Vander Waal equation for real gas. What do you understand by Vander Waal constant "a" and "b".
- Answer the following :—
 - Using the V.S.P.E.R. theory, identify the type of hybridization of OF_2 . What are oxidation state of O and F in OF_2
 - $SiCl_4$ is hydrolyzed but CCl_4 is not, why ?
 - Bond angles or shape of H_2O, NH_3 and CH_4 are different although central atoms have same type of hybridization (sp^3), why ?
- How does gold occur in nature ? How gold is extracted on large scale from auriferous quartz by cyanide method ? What do you mean by 18 carats gold. Explain colloidal gold.
- What are noble gases ? How noble gases is isolated from atmospheric air ? And how they are separated from each other ? Xe has closed shell or stable ns^2np^6 configuration but is known to form compounds with fluorine, why ?
- (a) Describe the characteristics of S block and p-block elements.
(b) Explain the diagonal relationship.
- Why radium is grouped with alkaline earth metals ? Write a note on the extraction of radium from Pitch Blende. Write uses of Radium.

* * *

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry (Hons.)

PART-I, PAPER-II

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

- State and explain first law of thermodynamics.
 - Derive a relation between heat capacity at constant pressure and constant volume.
- Give the I.U.P.A.C. names of the following compounds :—
 - $CH_3(CN) \cdot CH(CN)CH_2(CN)$
 - $CH_3CH_2 - CH = CHCOOH$
 - $CH_3CH_2 - CH - CH_2COCH_2COOH$
 - $CH_2 = CH \cdot CH = CH \cdot COOH$
 - Write the structural formulae of the following :—
 - 2-Pentanone
 - 2-methoxy-4-methylpentene
 - 2-methyl buta-1, 3-dien
 - 2, 3-dimethyl butane-2-ol
- Explain the semi permeabl membrane, osmosis and osmotic pressure. Determine the osmatic pressure experimentally by Birklay and Hartley method. How is osmatic pressure is related with molecular weight of a solute in solution ?
- What do you understand by elevation of boiling point. Deduce an expression for molecular weight of a solute with the elevation in boiling point of the solution.
- What are primary, secondary and tertiary amine ? How are primary, secondary and tertiary amines are separated from a mixture of the three. Arrange methyl amine, dimethyl amine, trimethyl amine and ammonia in order of increasing basicity and give its justification. Discuss mustard oil test for primary amine.
- Write down the structure of glycerol, its name according to I.U.P.A.C. system. How glycerol is prepared industrially from oil & fat ? Give its reaction with :—
 - Oxalic Acid
 - Mixture of ionc H_2SO_4 & HNO_3
 - H_9
- How tartaric acid is obtained from argol on large scale. Give its reaction with.
 - Ammonical Silver Nitrate
 - Fenton reagents
 - H_9
 - (d) $KHSO_4$
- Write two methods of preparation for each Aldelyde and Ketone. How will you distinguish between acetaldehyde and acetone. How does acetaldehyde react with.
 - $NaOH$ Solution
 - HCN
 - Phenyl Hydrazine
- Write short notes on :—
 - Addition Reaction
 - Cannizzaro's Reaction
 - Lassainges Test
- How nitrogen is estimated by Duma method experimentally. Describe it with necessary reactions.

* * *

Nalanda Open University
Annual Examination - 2013
B.Sc. Chemistry (Subsidiary), Part-I
Paper-I

Time: 3.00 Hrs.

Full Marks: 80

Answer any five questions. All questions are of equal value.

1. Explain water system on the basis of phase rule.
2. What do you understand by hydroxy acids? How is lactic acid manufactured by formation of sugar? How does it react with :
(a) H_2SO_4 (b) alkali + I_2 (c) HI (d) Fenton reagent.
3. What is Kohlrausch's law? How this law is applied to determine (a) the equivalent conductant of an weak electrolyte at infinite dilution and (b) solubility product of a sparingly soluble electrolyte.
4. (a) State and explain first law of thermodynamics.
(b) Explain the term
 - (i) isothermal change
 - (ii) Adiabatic change
 - (iii) reversible process
5. Describe the general methods of preparation of acid anhydrides. Give its important reaction and uses.
6. What is Protein? Describe the composition uses of Fibrous and Globular Proteins.
7. Describe two methods with equation to prepare phenol. How does it react with
 - (a) CCl_4 in NaOH
 - (b) CO_2 and NaOH
 - (c) fuming nitric acid in presence H_2SO_4 ?
8. Write short notes on:
 - (i) Inductive effect
 - (ii) Substitution Reaction
9. What is meant by rate constant of an nth order reaction? What is its unit? What do you understand by half life period of a reaction?
10. Explain the following:
 - (a) Degree of freedom in the phase rule
 - (b) Concentration Cell



NALANDA OPEN UNIVERSITY

B.Sc. Chemistry (Hons.)

PART-II, PAPER-III

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

1. What is Clausius-Clapeyron equation? Deduce thermodynamic derivation of expression for molal elevation constant.
2. What do you understand by reversible and irreversible cell? Deduce an expression for the concentration cell with transference.
3. Describe Thomson's experiment to determine e/m ratio of value of an electron.
4. What do you mean by term transition elements. Give reasons to explain the following :—
 - (a) Generally compounds of transition metals are coloured. Why?
 - (b) Almost all transition metal form complex compounds. Why?
 - (c) Generally transition metals are paramagnetic.
5. Explain different types of isomerism shown in co-ordination chemistry.

Or,

What do you understand by Werner's theory for the formation of complex compounds? What are its main weaknesses?

6. What are molecular formulae of Caro's and Marshall's acid? Discuss their two methods of preparation and properties. Write down their structure (not the proof).
7. How is potassium permanganate prepared on the large scale? How does $KMnO_4$ react with (a) H_2S in acid medium (b) Oxalic acid in presence H_2SO_4 (c) KI in acid medium. Calculate equivalent weight of $KMnO_4$ in different medium.
8. How does lead occur in nature? How is it extracted from Galena ore. Write three alloys of Pb with their composition and uses.
9. What do you mean by the term quantitative analysis? Give the principle of volumetric estimation of copper by using standard E.D.T.A. solution.
10. Write notes on :—
 - (a) Common Ion effect.
 - (b) Importance of solubility product in salt analysis.
 - (c) Predicting Spontaneity of the cell reaction.

* * *

Examination Programme, 2013

Bachelor of Science, Part-II

All Honours Subjects (B.Sc., Part-II के सभी विद्यार्थियों के लिए)

(Except B.Sc. Geography & Home Science), (B.Sc., Part-II भूगोल और गृह विज्ञान को छोड़कर)

Date	Paper	Time	Name of Examination Centre
03/6/2013	HONOURS PAPER – III	3.30 to 6.30 pm	Nalanda Open University, Patna
05/6/2013	HONOURS PAPER – IV	3.30 to 6.30 pm	Nalanda Open University, Patna
07/6/2013	(SUB.) (Botany -II)	8 to 11 am	Nalanda Open University, Patna
08/6/2013	(SUB.) (Math -II)	8 to 11 am	Nalanda Open University, Patna
10/6/2013	(SUB.) (Chemistry - II)	8 to 11 am	Nalanda Open University, Patna
11/6/2013	(SUB.) (Geography -II)	8 to 11 am	Nalanda Open University, Patna
12/6/2013	(SUB.) (Physics- II)	8 to 11 am	Nalanda Open University, Patna
13/6/2013	(SUB.) (Zoology - II)	8 to 11 am	Nalanda Open University, Patna
15/6/2013	(SUB.) (Home Science II)	8 to 11 am	Nalanda Open University, Patna
19/6/2013	Hindi 100 orUr 50+Hn50	3.30 to 6.30 pm	Nalanda Open University, Patna

NALANDA OPEN UNIVERSITY

B.Sc. Chemistry (Hons.)

PART-II, PAPER-IV

Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

1. What are Carbohydrate ? How are they classified ? Establish the open chain structure of fructose.
2. Why amino acids are weaker acids than the corresponding unsubstituted acids ? Explain the following with reference (i) Peptide Linkage (ii) Zwitter ion.
3. Write note on the following :—
(a) Benzoin condensation (b) Sand meyer reaction (c) Friedal-craft reaction.
4. (a) Define and explain the following term :—
(i) Specific conductance (ii) Equivalent conductance (iii) Molar conductance
(b) Describe an experimental procedure to determine specific conductance of a solution using meter bridge.
5. (a) State and explain the necessary condition for a compound to exhibit optical isomerism.
(b) Discuss the optical isomerism exhibited by tartaric acid.
6. (a) Explain what is observed when,
(i) a beam of light is passed through colloidal solution.
(ii) an electric current is passed through colloidal solution.
(b) Write at least four applications of colloidal solution.
7. (a) Is ethyl zinc iodide is a Grignard reagent ? Why is zinc dialkyl less reactive than lithium alkyl.
(b) How would you synthesize the following :—
(i) $C_6H_5 - COOH$ from C_6H_5Br
(ii) $CH_3CH_2 - \overset{\overset{OH}{|}}{C} - CH_3$ from CH_3MgBr
(iii) $C_6H_5 - \overset{\overset{CH_3}{|}}{C} - CH_3$ from $(CH_3)_2Zn$
8. Write notes on, (i) RNA, (ii) DNA.
9. Give important methods of introducing of -OH group in an aromatic ring. Distinguish between phenol and ethanol.
10. Discuss the carbonium ion rearrangement by taking example of pinacol-pinacolone rearrangement.

* * *

: Important Notice :

Programme of B.Sc Part-II, Chemistry (Hons.) Practical Counselling Classes and Examinations-2013

Practical Counselling Classes

Date	Time
20.06.2013 to 22.06.2013	11:30 AM to 3:30 PM

Practical Examinations

Date	Time	Paper
24.06.2013	11:30 AM to 2:30 PM	III
24.06.2013	2:45 PM to 5:45 PM	IV

Venue : Chemistry Lab IVth Floor Biscomaun Bhawan, Patna-01.

NALANDA OPEN UNIVERSITY
B.Sc. (Hons.), Part-II
Chemistry (Subsidiary), PAPER-II
Annual Examination, 2013

Time : 3 Hours.

Full Marks : 80

Answer any Five Questions. All questions carry equal marks.

1. Choose the correct answer from the following statements and given options :—
 - (i) The general electronic configuration of transition metal series,
(a) $(n-1)d^{1-5} ns^1$ (b) $(n-1)d^{1-10} ns^1$ (c) $(n-1)d^{10} ns^{1-2}$ (d) $(n-1)d^{1 to 10} ns^{1-2}$
 - (ii) All alkali metals and alkaline earth metals are,
(a) s-block elements (b) p-block elements (c) d-block elements (d) f-block elements
 - (iii) All inert gases (elements) belong to,
(a) Zero group of P.T. (b) 1st group of P.T. (c) III group of P.T. (d) IV group of P.T.
 - (iv) Among the following transition elements. Which shows the highest oxidation state,
(a) $3d^3 4s^2$ (b) $3d^5 4s^1$ (c) $3d^5 4s^2$ (d) $3d^6 4s^2$
 - (v) The effective atomic number of Nickel in the complex $Ni(CO)_4$ is,
(a) 28 (b) 30 (c) 32 (d) 36
 - (vi) Oxidation number in the complex $(Co(en)_3)Cl_3$,
(a) Zero (b) +3 (c) 6 (d) -3
 - (vii) Electron affinity increasing order is as,
(a) $F < Cl < Br < I$ (b) $F > Cl > Br > I$ (c) $I < Br < F < Cl$ (d) $I < Cl < Br < F$
 - (viii) Which of the following has greatest affinity for hemoglobin ?
(a) CO (b) CH_4 (c) CO_2 (d) H_2
2. (i) Write the I.U.P.A.C. name of the following complex :—
(a) $[Co(NH_3)_6]Cl_3$ (b) $LiAlF_4$ (c) $Ni(CO)_4$ (d) $[Pt(NH_3)_2 Cl_4]$
(ii) Write the formulae for the following according to I.U.P.A.C. rules :—
(a) Tris (ethylenediamine) cobalt (III) chloride. (b) Potassium oxoferrate (IV)
(c) Potassium hexaeyno ferrate (d) Potassium frixalato cobaltate (III)
3. What do you mean by the term transition elements. What are special features of transition metals.
4. What do you understand by Werner theory. What are its merits and weaknesses.
5. Give two methods of preparation of perdisulphuric acid. Write down its structural formula. How does it react with :—
(a) KOH (b) KI (c) H_2O
6. How is potassium permanganate prepared on a large scale. What happens when,
(a) H_2O gas is passed into acidified $KMnO_4$ solution.
(b) KI is added to solution $KMnO_4$ in acid medium.
(c) When Cl_2 is passed into the potassium magnet.
7. What happens when,
(a) SiO_2 reacts with Hf.
(b) CO reacts with NaOH.
(c) Steam is passed over red hot iron.
(d) CO is passed over heated Ni at $80^\circ C$.
8. (a) Principle involved in the volumetric estimation of Fe^{2+} ion.
(b) Principle involved in the gravimetric estimation of Barium.
9. How can you prepare potassium dichromate on a large scale. Give its reaction within,
(a) Acidified $FeSO_4$, (b) Oxalic Acid, (c) H_2O , in acid medium.
10. Describe two of the air pollutants in respect of (i) Sources, (ii) Harmful effects of preventive measure.

* * *

Nalanda Open University
Annual Examination - 2013
B.Sc. Chemistry (Honours), Part-III
Paper-V

Time: 3.00 Hrs.

Full Marks: 80/75

Answer any Five Questions. All questions carry equal marks.

1. State and explain phase rule and use it to discuss the phase diagram of sulphur system.
2. What do you mean by Bravais Lattices? explain the cubic system. How many particles are occupied by the unit cell of these lattices?
3. What are the postulates of Collision theory? Derive the expression for rate constant in terms of a parameters of collision theory.
4. What is heterogeneous catalysis? State the theory of heterogeneous catalysis. Explain with example the activity and selectivity of heterogenous catalysis.
5. (a) Explain the following:
(a) Molar viscosity (b) Molar-Refracton (c) Dipole Moment
(b) The dipole moment of NH_3 is 1.48D. If the angle H-N-H is 108° . Calculate bond moment of N-H bond.
6. What do you understand by adsorption. Discuss the factors on which adsorption depends. Derive and discuss the characteristics of Langmuir adsorption isotherm.
7. Using x-rays beam of known frequency (or wave length) deduce Bragg's equation for the measurement of the interplaner - distances in a crystal.
8. (a) State and explain Stark-Einstein's law of photo chemical equivalence.
(b) Discuss the mechanism for the formation of HCl when the mixture of hydrogen and chlorine exposed to light of wave length less than 4000\AA .
9. What is doping in crystal lattice? How does it work as semiconductor? Explain the difference between n-type and p-type semiconductor.
10. Write notes on the following:
(a) Parachor
(b) Chemiluminescence
(c) Radius Ratio Rule and its relation with co-ordination number.



Examination Programme-2013

B.Sc (Part-III)

Botany, Chemistry, Mathematics, Physics, तथा Zoology Honours के सभी विद्यार्थियों के लिए

Date	Papers	Time	Examination Centre
30/4/2013	Honours Paper-V	3.30 to 6.30 p.m	Nalanda Open University, Patna
02/5/2013	Honours Paper-VI	3.30 to 6.30 p.m	Nalanda Open University, Patna
04/5/2013	Honours Paper-VII	3.30 to 6.30 p.m	Nalanda Open University, Patna
06/5/2013	Honours Paper-VIII	3.30 to 6.30 p.m	Nalanda Open University, Patna
08/5/2013	Paper -XV (Gen.Studies)	3.30 to 6.30 p.m	Nalanda Open University, Patna

Nalanda Open University
Annual Examination - 2013
B.Sc. Chemistry (Honours), Part-III
Paper-VI

Time: 3.00 Hrs.

Full Marks: 80/75

Answer any Five Questions. All questions carry equal marks.

1. Explain the term: probability and radial of an electron in an atom. Draw radial probability distribution curve for S and p-orbitals.
2. Construct and discuss M.O diagrams of CO and NO molecules and predict their magnetic behaviour.
3. What is crystal field theory for the formation of a complex compound? How does this theory account for the fact that $[\text{CoF}_6]^{-3}$ is a paramagnetic but $[\text{Co}(\text{NH}_3)_6]^{3+}$ is a diamagnetic compound though both are octahedral compound?
4. What do you understand by the term symmetry element and symmetry operation? By giving suitable example differentiate a symmetry element from symmetry operation.
5. What are the important ore of Molybdenum? Give the details of the extraction of molybdenum from its important ore. Why molybdenum exhibit different oxidation state. Write short notes on ammonium molybdenum.
6. What are the important ores of Beryllium? Write down their formulas and the names. How is beryllium extracted from its ore? The first I.P value of beryllium is greater than that of Lithium but the position is reversed in the second I.P. Explain: Why Beryllium halides are covalent where as magnesium halides are ionic?
7. What are lanthanides? Write down their electronic configuration. What do you mean by lanthanide contraction? What are the consequences of lanthanide contraction?
8. Write notes on:
(i) Hole formulism (ii) R.S coupling (iii) Magnetic susceptibility.
9. What are important role of potassium and iron in the development of animal and plants.
10. Why Liquid Sulphur dioxide is a good non-aqueom solvent? Explain, the following type of reaction in liquid sulphur dioxide with suitable examples.
(i) Acid–Base reaction
(ii) Precipitation reaction
(iii) Solvo lysis reaction



Examination Programme-2013
B.Sc (Part–III)

Botany, Chemistry, Mathematics, Physics, तथा Zoology Honours के सभी विद्यार्थियों के लिए

Date	Papers	Time	Examination Centre
30/4/2013	Honours Paper–V	3.30 to 6.30 p.m	Nalanda Open University, Patna
02/5/2013	Honours Paper–VI	3.30 to 6.30 p.m	Nalanda Open University, Patna
04/5/2013	Honours Paper–VII	3.30 to 6.30 p.m	Nalanda Open University, Patna
06/5/2013	Honours Paper–VIII	3.30 to 6.30 p.m	Nalanda Open University, Patna
08/5/2013	Paper –XV (Gen.Studies)	3.30 to 6.30 p.m	Nalanda Open University, Patna

Nalanda Open University
Annual Examination - 2013
B.Sc. Chemistry (Honours), Part-III
Paper-VII

Time: 3.00 Hrs.

Full Marks: 80/75

Answer any Five Questions. All questions carry equal marks.

1. Define the aromaticity :- making a special mention of Hockel Rule. Discuss modern theory of Aromaticity. Explain why fulvene and Azulene are aromatic.
2. Discuss the preparation, mechanism and application of any two of the following reagents.
(i) N-Brom succinimide (ii) Peracetic acid (iii) Lead tetra acetate.
3. Discuss the degradative and synthetic method for ascertaining the structure of isoflovene. How is isoflovene is related to flovene?
4. How is pyridine prepared? Is it a base and its basicity is greater than that of Pyrrole? Why the electrophilic substitution in pyridine occurs chiefly in position-3?
5. Discuss the degradative and synthetic method to establish the structure of Anthracene. Why, in Anthracene, the attack of an electrophile, preferentially occurs at C₉ and C₁₀. How will you, synthesis Anthraquinone from Anthracene.
6. Explain: -Cl group is activating yet it is ortho and para directing in electrophilic aromatic substitution reactions. Discuss briefly the method of isolation of -ortho-para and meta isomer from obtained by disubstitution of benzene.
7. (a) What are differences between SN₁ and SN₂ reactions?
(b) Discuss the SN₂ reaction mechanism of substitution of alkyl halide.
8. Explain the mechanism of hydroboration of alkene?
9. How is xanthine prepared from uric acid? How does Xanthene react with KClO₃ in the presence of hydrochloric? How is Xanthine synthesised by Tranbe's method?
10. How was actual indigo obtained from plant? Give two methods for its (Indigo) synthesis. Give its important uses.



Examination Programme-2013
B.Sc (Part-III)

Botany, Chemistry, Mathematics, Physics, तथा Zoology Honours के सभी विद्यार्थियों के लिए

Date	Papers	Time	Examination Centre
30/4/2013	Honours Paper-V	3.30 to 6.30 p.m	Nalanda Open University, Patna
02/5/2013	Honours Paper-VI	3.30 to 6.30 p.m	Nalanda Open University, Patna
04/5/2013	Honours Paper-VII	3.30 to 6.30 p.m	Nalanda Open University, Patna
06/5/2013	Honours Paper-VIII	3.30 to 6.30 p.m	Nalanda Open University, Patna
08/5/2013	Paper -XV (Gen.Studies)	3.30 to 6.30 p.m	Nalanda Open University, Patna

INSTRUCTIONS TO CANDIDATE

B.Sc.Part-III, Chemistry (H) Counselling and Practical Programme see the back page

Nalanda Open University
Annual Examination - 2013
B.Sc. Chemistry (Honours), Part-III
Paper-VIII

Time: 3.00 Hrs.

Full Marks: 80/75

Answer any Five Questions. All questions carry equal marks.

1. What do you mean by electromagnetic spectrum? Discuss the basic principle of magnetic resonance spectroscopy.
2. What is biogas? Give its composition. How it is prepared on large scale? What are its uses?
3. What is meant by knocking? Why is ethylene bromide added when TEL is used as antiknock?
4. What is soil pollution and soil pollutant? What are the effects of soil pollutant? How is soil pollution prevented?
5. What is green house effect? How it is caused? What are the major gases causing it? What are the adverse effects of green house effect?
6. Discuss the chemistry of UV spectroscopy. Explain the following electronic transition in ultraviolet spectroscopy.
(a) $\sigma \rightarrow \sigma^*$ transition (b) $n \rightarrow \sigma^*$ transition (c) $\pi \rightarrow \pi^*$ transition (d) $n \rightarrow \pi^*$ transition
7. Discuss the important characteristics of waste water. Describe any one of the biological waste water treatment processes in detail.
8. What do you mean by rubber? Write the structure of the repeating unit of natural rubber. What is vulcanization of rubber? Mention its uses.
9. Write a short note on deshielding and shielding effect with suitable examples. Describe clearly what you know about the coupling constant?
10. Write a note on the following:
(a) Aviation Gasoline
(b) Neoprene
(c) Effect of acid-rain



Examination Programme-2013
B.Sc (Part-III)

Botany, Chemistry, Mathematics, Physics, तथा Zoology Honours के सभी विद्यार्थियों के लिए

Date	Papers	Time	Examination Centre
30/4/2013	Honours Paper-V	3.30 to 6.30 p.m	Nalanda Open University, Patna
02/5/2013	Honours Paper-VI	3.30 to 6.30 p.m	Nalanda Open University, Patna
04/5/2013	Honours Paper-VII	3.30 to 6.30 p.m	Nalanda Open University, Patna
06/5/2013	Honours Paper-VIII	3.30 to 6.30 p.m	Nalanda Open University, Patna
08/5/2013	Paper -XV (Gen.Studies)	3.30 to 6.30 p.m	Nalanda Open University, Patna

INSTRUCTIONS TO CANDIDATE

B.Sc.Part-III, Chemistry (H) Counselling and Practical Programme see the back page